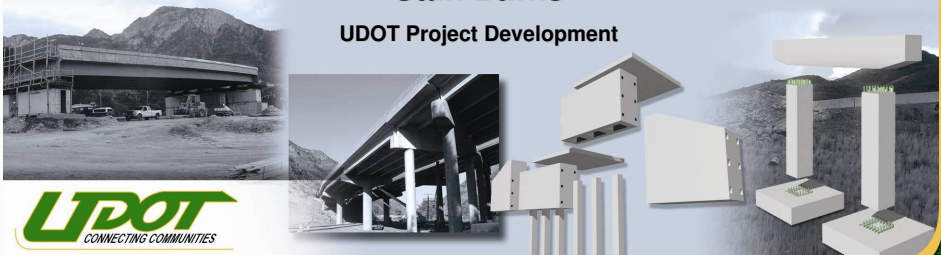


SPMT Lessons Learned

UTAH
Department of Transportation
**ACCELERATED
BRIDGE CONSTRUCTION**
PHASE II: PRELIMINARY DEVELOPMENT WORKSHOP

**SPMT Accelerated Bridge
Construction – Summer 2008**

Stan Burns
UDOT Project Development



UTDOT
CONNECTING COMMUNITIES

Self-Propelled Modular Transport Projects

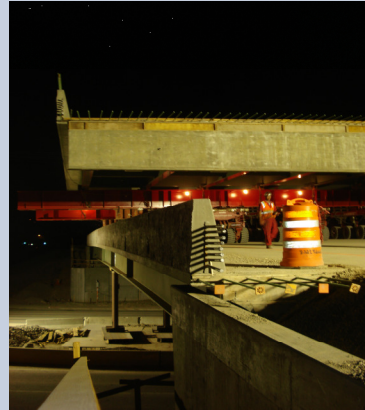
- I-80, State to 1300 East
- I-80, East and Lambs Canyons
- I-215, 3300 South



UTDOT
CONNECTING COMMUNITIES

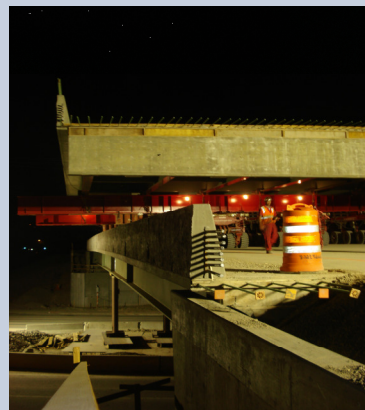
Project Descriptions

- I-80, State to 1300 East
 - 7 Interstate Bridges in 41 Days
- I-80, East and Lambs Canyons
 - 4 Interstate Bridges on 2 Separate Weekends in less than 24 hrs
- I-215, 3300 South
 - 1 Bridge over the Interstate in less than 18 hrs



Project Descriptions

- I-80, State to 1300 East
 - Dimensions varied up to 95'x175'
 - Weight varied up to 3.3M #
 - Travel Path up to 1.5 miles
- I-80, East and Lambs Canyons
 - Original Contract to Remove Decks
 - Staging area next to existing bridges
- I-215, 3300 South
 - Dimension 40' x 150'
 - Travel Path approx 1 mile



Contracting Methods

- I-80, State to 1300 East
 - CMGC
 - \$103M, Eng Est. \$ 97M
- I-80, East and Lambs Canyons
 - Design Build
 - \$ 9M, Eng Est. \$ 7M
 - Incentives approx \$640k
- I-215, 3300 South
 - Design Build
 - \$ 4M, Eng Est. \$ 6M
 - Incentives approx \$500k



Bridge Instrumentation

- Deflection
- Twist
- Surveyor
 - Total Station
 - Tape Measure
- Remote Sensing
 - Stress Strain
 - Inclinometer



Bridge Instrumentation

- Instrumentation
 - Stress/Strain, Laser, Inclinometer
 - Real Time
 - Confirm design assumptions
 - Development of future specifications
 - Locations - deck, girders



Communication

- Innovate Utah
 - <http://www.udot.utah.gov/innovate80/>
- Carrier Beam
- Text Messaging



Operation Staging Areas Bridge Farm @ 1300 East



I-80 State to 1300 East Sequence

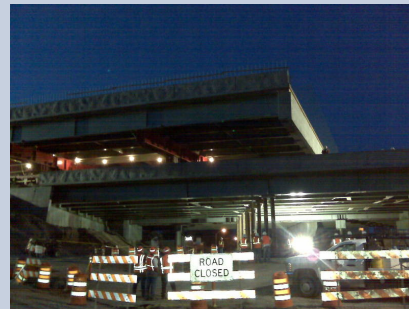


I-80 State to 1300 East Sequence



Bridge over Bridge

- Monitor Deflection
- Travel Speed < 1 mph
- Temp Shoring @ Girder



Carrier Beam

- What Happened
- What was the Fix
- What were the Lessons Learned



Highland Structure & 1300 East w/ Original Carrier Beams

- Lead carrier beam developed structural distress



Structure @ Highland with Original Carrier Beams

- Structure weight transferred to skid jacks
- Location of carrier beam experiencing structural distress



Carrier Beam Failure

Web Stiffeners

Flange Chain Attachment

SPMTs @ Bearing

Skid Jack Bearing

Skid Jack



Carrier Beam Failure

- Failure Analysis
 - Load double from 4 SPMTs to 2 Skid Jacks
 - Discontinuous additional bottom plate
 - Stress concentration
 - Flange elastic bending
 - Web crippling
 - Twist of double beam



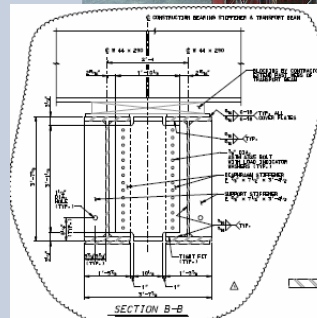
Retrofit of Carrier Beams at Highland before Transporting back to Bridge Farm

- 4 Web stiffeners added
- Additional Bottom Plate
 - Between Skid Jacks and No 1 & 4 SPMT units
 - Plate Dimension 1" x 24" x 5'
- Approx 1/2 the twist removed



New Carrier Beams

- Rolled 44 x 290 Steel Girder
- Geometric Section
 - Square – 44" x 44"
- Web Stiffeners
 - All pick pts, SPMTs, skid & climbing jacks
 - Includes all future bridges
- Additional Top/Bottom Plate
 - Ea. Flange – 1" x 15"
- Chains tied to web stiffeners



Risk Identification – Owner, Contractor and Engineer

- Identified 5 Categories w/ 135 Items:
 - Carrier Beam
 - Perform 2 independent QCs
 - Utilities
 - Shutting down large H₂O line
 - Travel Path
 - Verify/confirm travel speed < 2mph
 - Geotech
 - Re-evaluate projected utility stresses
 - Launch
 - Review allowable eccentric load on climbing jacks



Issues

- Utilities
- Geotechnical
- Carrier Beam
- Bearings
- Approach Slabs
- Engineer Drawings
- Checklist, Spare Parts



Utilities

- Waterlines 6" to 30" Diameter
 - Protection
 - Plated, new valves installed, lines shut down
 - Companies on site
- Gas Lines High & Low Pressure
 - Protection
 - Steel Plate, new valves

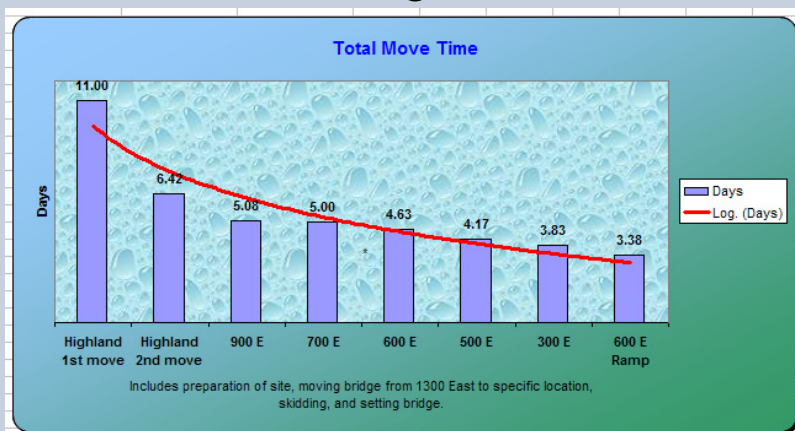


Geotechnical

- Slope Stability 1:1.5 distance back
- Park 50' back from abutment
- Backfill toe of MSE wall
- Instrumentation
- Schedule
- Complacency



Operation – Time Req. to Set Bridges



Operation Staging Areas I-80 East Canyon

- New Bridge in Median
- Girders Set
- Deck to be formed



I-80 Lambs Canyon

- Unique Staging
- Unique Temp Abutments
 - Structure set on “Garage”
 - Pick Pts and Construction Bearings the same.



Bearings & Approach Slabs

- Bearings
 - Setting of Structure
 - Shims
- Approach Slabs
 - Critical Path
 - Expandable Foam vs. Grout
 - 2 Year Warranty



3300 South & I-215

- Contractor determine location of BSA (Bridge Staging Area) and TP (Travel Path)
- Piles, abutment under construction



3300 South & I-215

- Demo takes place Friday night and Saturday morning
- Challenging
 - Restricted area
 - Condition of girders



3300 South & I-215

- Bridge move in Saturday afternoon
- Approx 16 closure
- Approach slab cast in place



Questions?

